

Short- and long-term impacts of PIT tags on hatchery Fall and Spring Chinook Salmon

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In two double-tag experiments, we examined the effects of PIT tags on hatchery Chinook salmon. In the first study, short term (<86 days) impacts of PIT tags were estimated on post-release survival of subyearling Bingham Creek Hatchery fall Chinook salmon. We employed an Unhandled Control (UC) group, which was not disturbed during the tagging process, and a Handled Control (HC), which experienced the same stressors (netting, transfer, anesthetic, etc.) as PIT tagged fish. All groups were otolith marked as eyed eggs allowing identification of “unmarked” treatment and control group recaptures. Replicate releases were made. After emigrating 21 km downstream of the release site, PIT tag retention averaged 99%. Post-release survival of HC groups did not differ significantly from UC groups, indicating fish had sufficient time to recover from handling stress prior to release. PIT tagged groups had significantly lower survival than UC groups, averaging 24% lower survival (range 19-27).

In the second study, we PIT and Coded-Wire (CW) snout tagged 37,000 to 40,000 juvenile upper Yakima River hatchery spring Chinook salmon annually over 5 broodyears in a double-tag study to test the assumptions that PIT tags are not lost and do not affect post-release survival, behavior, or growth. All non-PIT-tagged (NPT) fish were marked with elastomer material and a CW tag in a body area other than the snout (e.g. posterior to the dorsal fin). At release, average PIT tags loss was 2.0% (95% CI = 0.7–3.2%). Six months to 4 years after release, PIT tag loss averaged 18.4% (95% CI = 17.2–19.5%) and CW tag loss averaged 6.7% (95% CI = 3.5–9.9%). Adult tag losses did not significantly increase with age of return, indicating that the majority of PIT tag loss had occurred within the first 6 months after release. Estimated Smolt-to-Adult Recruit Survival (SARS) of PIT-tagged fish was significantly lower than that of NPT fish because of a combination of tag loss and reduced survival, resulting in a 25.0% average underestimate of SARS. After correcting for PIT tag loss, we estimated PIT tag SARS to be as much as 33.3% lower than NPT SARS; averaging 10.3%. Mean lengths and

weights of PIT-tagged adults were consistently lower than of NPT adults in all age comparisons. However, only age-4 PIT-tagged adults were significantly smaller (mean length difference = 1.1 cm; mean body weight difference = 0.1 kg). There was a significant non-linear relationship between the reduction on body length and SARS. As SARS decreased, the average reduction in adult body length due to PIT tags increased. There was no significant difference between migration timing of PIT-tagged and NPT adults within the upper Yakima River. PIT tag recovery efficiency averaged 98.7% and straying of out-of-basin CW tagged fish into the Upper Yakima River was less than 0.01%.

Tests of the critical assumptions of no tagging effects on behavior, growth and survival of experimental subjects should be conducted under actual study conditions using the species and life history type being investigated. Short term studies using protected, non-representative environments (e.g. net pens) will be expected to underestimate effects.